



# THE KLAMATH KALEIDOSCOPE

A Newsletter of the Klamath Network  
Inventory and Monitoring Program  
Fall/Winter 2004/5

## *Partnerships for the Parks:*

### *How Collaborative Efforts Help the Inventory and Monitoring Program Meet the Natural Resource Challenge*

By **Daniel Sarr**, PhD, Klamath Network I&M Coordinator,  
and **Windy Bunn**, Klamath Network Biological Science Technician

#### **Introduction: The History of Scientific Research in the National Parks**

Though many Americans consider the National Parks to be among the world's premiere conservation networks, the role of science in the parks has not always been clear or consistent. In fact, it has been argued that for most of its history, the Service has been more concerned with showcasing nature than developing the science to conserve park ecosystems.

Science has moved forward at a slow pace in the parks, and most early efforts were sporadic, isolated, and personality-driven. Interest in conducting research on park lands originated with the work of one man, Dr. Joseph Grinnell, founder of the Museum of Vertebrate Zoology at the University of California, Berkeley. His inventories of ecological zones in the Sierra Nevada and southern Cascades included lands in Yosemite and Lassen

Volcanic National Parks, respectively. In 1929, Grinnell's graduate student George Wright, inspired by his mentor's work, conducted a survey of park wildlife in

the Western states (funded through his own personal fortune). The success of this effort in turn inspired the Park Service to establish a wildlife division of nine biologists, which conducted a decade of substantial scientific activity



*The Klamath Bird Observatory is one of many partner organizations that provide invaluable collaboration to the Klamath Network.*

within the Service. Humble as it was, the wildlife division, led by Wright, promoted an ecological awareness in the Service and questioned the utilitarian and recreational focus that had dominated the bureau up to that time. With Wright's early death in the

## **The Klamath Network of the National Park Service**

(541) 552-8575

**Daniel Sarr**

Inventory and Monitoring Coordinator

**Bob Truitt**

Data Manager

Newsletter edited by Joe Madden

### **The Parks of the Klamath Network:**

**Crater Lake National Park**

[www.nps.gov/crla/](http://www.nps.gov/crla/)

(541) 594-3100

**Lassen Volcanic National Park**

[www.nps.gov/lavo/](http://www.nps.gov/lavo/)

(530) 595-4444

**Lava Beds National Monument**

[www.nps.gov/labe/](http://www.nps.gov/labe/)

(530) 667-2282 Ex.232

**Oregon Caves National Monument**

[www.nps.gov/orca/](http://www.nps.gov/orca/)

(541) 592-2100

**Redwood National Park**

[www.nps.gov/redw/](http://www.nps.gov/redw/)

(707) 464-6101

**Whiskeytown Natl. Recreation Area**

[www.nps.gov/whis/](http://www.nps.gov/whis/)

(530) 246-1225

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mid-1930's, the wildlife division waned, and a more visitor-centered culture permeated the service until the early 1960s, when the role of science began another upswing. Research in the parks has been steadily increasing for over three decades, but until recently, scientific interest remained highly skewed toward the more visible parks. Larger flagship parks and parks close to urban areas attracted research interest and public support in the form of funding and volunteer conservation efforts. Meanwhile, smaller, more isolated, or lesser-known parks typically had to make do with less research, funding, and volunteerism.

## **The Natural Resource Challenge and the Klamath I&M Program**

With the implementation of the Natural Resource Challenge in 1999, the NPS crafted an action plan to bring science to *all* the parks in order to better sustain and enhance natural resources. Two of the major goals of the Challenge were to accelerate natural resource inventories and to expand monitoring efforts already underway through the NPS Inventory and Monitoring (I&M) Program. Under the Natural Resource Challenge, the I&M program has received increased funding to complete park inventories and to pursue further monitoring activities in park units with significant natural resources. With this mandate to broaden and accelerate scientific research in the smaller, less prominent parks as well as in the larger ones, a need for inter-park coordination and collaboration has arisen. In fact, partnerships have become the foundation of the Natural Resource Challenge. The 270 park units with significant natural resources have been condensed into 32 networks to facilitate collaborative planning, staffing, and resource-sharing among large and small park units. Additionally, the park networks have fostered partnerships that extend outside the NPS. (*cont'd on p. 3*)

The Klamath Network Inventory and Monitoring Program, launched in 2000, has grown into a multi-faceted endeavor with contributions from scientists in the parks, other federal agencies, and regional universities. National Park Service partnerships at the national and regional levels are critical to our efforts to better understand our parks and to share our findings with a broader audience. Other federal land management agencies, such as the Forest Service, Bureau of Land Management, and U.S. Fish and Wildlife Service, offer insight and experience from decades of land management and monitoring, and also create a forum for the exchange of ideas. The USGS plays a crucial role in the network science team by providing assistance with the long-term monitoring plan, while also participating in shorter-term research efforts within the network parks.

Through Cooperative Ecosystem Studies Units (CESUs) and other cooperative agreements, the Klamath Network has built partnerships with university scientists and students in Oregon, California, and throughout the nation. With the network office located on the campus of Southern Oregon University, the program has been able to provide opportunities for university students and researchers to become more involved in park projects. In return, it gains the talent and drive of university students and the expertise of top scientists in key areas. Collaborative projects have explored habitats from the subalpine zones of Lassen Volcanic and Crater Lake National Parks to the nearshore waters of the Redwood Coast.

Nonprofit partners are important allies in our conservation and educational missions. The Klamath Network I&M Program has worked closely with the Klamath Bird Observatory to implement field inventories and with the ScienceWorks Hand-On Museum to bring science to the public.

As the Klamath Network continues its effort to monitor and conserve the natural resources of the network parks, existing and new science and education partnerships will become increasingly vital to our success. The Klamath Network I&M Program gratefully acknowledges the assistance of current partners and welcomes future collaborations in the conservation of ecosystems within the parks and the surrounding landscape.

Persons interested in learning more about the National Park Service's Inventory and Monitoring Program can visit the National Inventory and Monitoring Webpage at: <http://www.nature.nps.gov/im/>

## **Klamath Network I&M Calendar** **Fall/Winter 2004/5**

### ***Recent Highlights***

***August-October, 2004 -- Forest Bat Inventories conducted in Crater Lake NP, Redwood NSP, and Oregon Caves NM***

***September, 2004 -- Klamath Network I&M Program participated in a Non-native Species Scoping Workshop, in Portland, Oregon***

***September, 2004 -- Wetland Inventory began in Lassen Volcanic NP, Crater Lake NP, and Oregon Caves NM***

***October, 2004 -- Klamath Network Phase I Vital Signs Monitoring Plan Completed***

### ***and Upcoming Events***

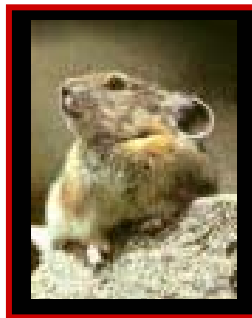
***June-September 2005 Forest Bat inventories to continue in Crater Lake NP, Redwood NSP, and Oregon Caves NM***

***Spring 2005 Klamath Network will begin invasive species early detection program in partnership with USGS***

**L**ava flows and their associated features are the centerpiece of the natural resources in Lava Beds National Monument, comprising nearly 95% of the Monument's 186.5-km<sup>2</sup> area. The Monument's more than 30 lava flows contain the greatest concentration of lava-tube caves in the entire United States. Because of the cooler, moister microclimates that occur in their shelter, the Monument's more than 500 caves constitute an important geologic and biotic resource for the entire Sierra-Klamath-Cascade-Great Basin ecoregion. Given that the surrounding pahoehoe flows and semi-arid habitat of the region are generally much hotter and drier, lava tubes and ice caves represent thermal refugia for a diversity of species usually associated with cooler climates. These species include pikas, woodrats, many vascular and nonvascular plants, lichens, and many invertebrates. Many of these cool-climate species are characterized by restricted distributions, especially given the current climatic warming trend being observed both globally and in the Intermountain West.

## The Lava-Tube Microenvironments of Lava Beds National Monument

By Erik Beever, PhD, Wildlife Ecologist, Oregon State University



*The American pika (Ochotona princeps) is one of many organisms that depend on the cool microclimates associated with lava-tube caves at Lava Beds NM. They can be seen hay-making (left) or keeping lookout at the entrance to their dens (right).*

Wildlife ecologist Erik Beever of Oregon State University has recently teamed with the Monument staff in undertaking a 2-year study of the thermal characteristics of the cave-tube landscape in the park. Of particular interest in the project is the question of how American pikas (*Ochotona princeps*) are able to persist in Lava Beds, over 800 m (2,645 ft) below the minimum elevation at which they are predicted to occur. American pikas are small (120-200 g) diurnal mammals that occupy talus, lava, and talus-like habitats. They are most closely related to rabbits and hares, and are characterized by their distinctive high-pitched alarm call and by the highly visible haypiles that they build outside their dens. The presence of pikas at Lava Beds below their normal elevation range is even more surprising considering that nearly 40% of the historically known pika populations in the adjacent Great Basin have been lost, apparently due in part to climatic warming trends.

In September 2004, Beever and Monument assistant Mariana Morris performed repeat surveys of numerous locations in the Monument at which pikas had been observed historically. Beever and Morris placed more than 15 remote (HoboTM) temperature- and humidity-recorders at these historic locations, and Beever was able to fine-tune his hypotheses about which specific variables (e.g., cave visitation rates, aspect or depth of cave, talus area) may be responsible for modulating the effects of high temperatures on pikas. Through this work and continued observation by Morris, pikas, which are active year-round, have now been observed in 2 months (Sept. and Nov.) during which they had never before been detected in the Monument. In 2005, a field assistant will complete re-surveys of historic pika locations, and collect information on other factors that may be critical to the persistence of this charismatic mammal at Lava Beds National Monument.

# Bryophytes at Crater Lake

## A Seven Thousand Year Experiment in Colonization

By Joe Madden, Klamath Network Outreach Intern

Bryophytes – mosses, liverworts, and hornworts, to the layperson – are the most primitive surviving terrestrial plants. They are often overlooked because of their humble stature, and perhaps because they lack the showy reproductive structures that characterize many flowering plants. However, to the bryologist they have an understated beauty of their own (though it may be visible only under magnification!) Bryophytes are also remarkably widespread, fascinatingly diverse in morphology, and notable for their ability to grow on a variety of substrates, from soil to tree bark to bare rock.

One of the outstanding puzzles in bryology involves the widely scattered geographic distributions of many bryophytes. Species that have hyperoceanic distributions occur only in moist areas with relatively cool summers, often near large bodies of water and/or at high altitude. These species are often restricted to very specific sites locally, but are global in their

distribution; several species known from the Pacific Northwest, for example, also occur in Japan, Scandinavia, and the Himalayas. Are these widely disjunct populations the isolated remnants of species ranges that, under past cooler climates, were once much broader? Or are they of more recent origin, having resulted from long-distance spore dispersal?

*TOP: Schistostega pinnata, a particularly elusive and beautiful moss found at Crater Lake.*  
*MIDDLE: detailed documentation is an essential part of the collection process.*  
*BOTTOM: Prof. Jessup, in full bryophyte-hunting gear, bags a specimen.*



the ecological slate clean for hundreds of miles around, all plant populations at Crater Lake must be 7,700 years old or younger. If bryophyte species are found that are far disjunct from their nearest known populations, it would indicate that they are indeed capable of long-distance dispersal. (cont'd, next page)

## *some botanical vocabulary...*

**bryophyte:** a group including the mosses, liverworts, and hornworts, bryophytes are the most primitive surviving land plants. They lack the sophisticated vascular tissue of seed plants, and they reproduce by spores.

**bryologist:** one who studies bryophytes.

**hyperoceanic:** refers to environments that are characterized by cool summer maximum temperatures and lots of moisture; hyperoceanic environments usually occur near large bodies of water and/or at high altitudes, and are a great place to look for rare bryophytes!

(cont'd from previous page) With high hopes of uncovering unexpected mosses and liverworts, Dr. Steve Jessup, Professor of Botany at Southern Oregon University, and I set off this summer on a four-day bryology expedition to Crater Lake. Though from a distance the Crater Lake caldera appears a harsh environment, all talus slopes and sheer rock faces, Dr. Jessup speculated that there might be hidden pockets of surprisingly high bryophyte diversity: The cooling influence of the lake, the presence of springs and seeps emanating from the caldera walls, and the shade provided by the steep southern side of the caldera might combine to create just the sort of cool, moist microclimates in which bryophytes thrive. We explored a wide array of habitats, including rock walls and sheltered grottoes near the water's edge, streams and seeps heavily overgrown with shrubs, the sheer cliffs and windswept pinnacles of Phantom Ship, the caldera's sparse woodlands, Devil's Backbone, and even the seemingly barren lava rock landscape of Wizard Island. And all our clambering up talus slopes and fighting through overgrown stream banks paid big dividends -- the cornucopia of mosses we found exceeded our wildest expectations!

Returning to the SOU campus in Ashland laden with boxes containing more than 300 specimens, we realized that the real work -- sitting down at the microscope and identifying all of these fascinating plants -- had not even begun. Early returns, however, are encouraging: One of the first specimens that Dr. Jessup inspected proved to be a species not previously recorded in the Pacific Northwest. We are enthusiastically anticipating additional discoveries and a return to the caldera in 2005 to continue exploring the bryophyte flora of Crater Lake.



*View of the Crater Lake caldera, with Phantom Ship, which proved a fertile site for moss collecting, in the middle distance.*

# W PROTECTING THE STREAMS AND LAKES OF HISKEYTOWN

By Jennifer Gibson, Ecologist, Whiskeytown National Recreation Area

The streams and lakes of Whiskeytown are essential to both people and wildlife alike, and the park's core function of preserving natural resources includes the protection and restoration of these aquatic resources. Whiskeytown Lake serves as the domestic water supply for several local communities and provides recreation for 700,000 visitors annually. At the same time, the park's Clear Creek watershed supports about 2% of the Sacramento River's salmon population. Whiskeytown Lake and its surrounding streams also support federally threatened southern bald eagles (*Haliaeetus leucocephalus*) and three California species of concern: foothill yellow-legged frogs (*Rana boylei*), tailed frogs (*Ascaphus truei*), and western pond turtles (*Clemmys marmorata*).

However, these aquatic resources have been compromised by an extensive history of mining and timber harvests. Besides the physical remnants of mining activities that still remain at Whiskeytown, run-off from abandoned mine lands has resulted in elevated levels of metals in stream sediments. Samples collected thus far indicate that in some areas, metals are at concentrations toxic to aquatic life. Similarly, timber harvests have left approximately 300 miles of skid roads, which cause surface erosion and landslides in lower Clear Creek.

To address these concerns, Whiskeytown has initiated a project with the U.S. Geological Survey-WRD to conduct bioassessments of the

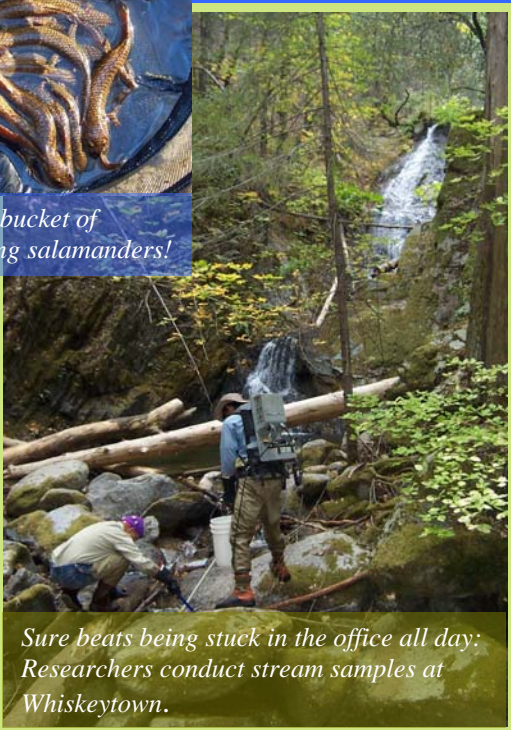
park's major watersheds. Unlike traditional water-quality monitoring, a bioassessment involves studying the health of biological communities and habitats, as well as monitoring the chemical condition of the water. The advantage of bioassessments is that, by incorporating the study of biological communities, they provide an integrated look at the effects of water quality and habitat quality over time. This holistic

approach may reveal environmental conditions or events that aren't reflected in simple water chemistry. Stream bioassessment procedures generally will focus on one of the three groups of organisms -- fish, benthic macroinvertebrates, and benthic algae -- which constitute the three major trophic levels in these stream communities.

Organisms from different trophic levels respond to pollution in different ways; a complete analysis therefore must include the study of multiple trophic levels. Characterizing all three levels will yield an assessment that covers multiple temporal and spatial scales. The bioassessments now being developed will provide a standard from which to measure the success of the park's future restoration projects.



*The catch: a bucket of healthy-looking salamanders!*



*Sure beats being stuck in the office all day: Researchers conduct stream samples at Whiskeytown.*

# *Pyrodiversity*

## BEGETS

# *Biodiversity*

### IN THE KLAMATH REGION

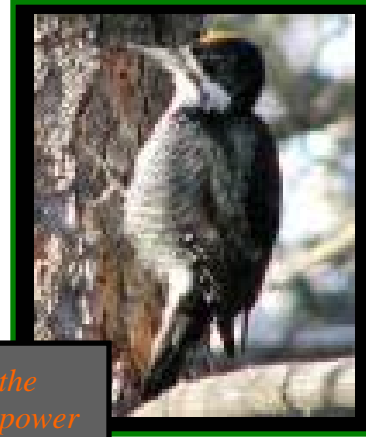
By Dennis Odion, PhD  
Ecologist, Southern Oregon University

Among the world's temperate regions, the Klamath Region is renowned for its unusually high biodiversity. Explanations for this diversity often begin with the region's complex geology and its role as a refuge for species during climatic extremes. However, complexity in natural disturbances has also played an important role in promoting biological diversity.



*Though the destructive power of fire can be terrifying, species such as the black-backed woodpecker depend on it to maintain their habitat.*

Ecological disturbances are discrete events that create space, resources, and opportunities for new populations of organisms. As illustrated by the Yellowstone fires of 1988, sudden, sweeping transformation of the landscape and dramatic, “catastrophic” loss of life are



the aspects of ecological disturbance that typically capture the public's attention. The slower and more subtle ecological renewal that follows a disturbance

is often overlooked and underappreciated. However, as studies of the effects of the Yellowstone fires have demonstrated, disturbances are ecologically vital. In fact, the idea that natural disturbance cycles are necessary for the

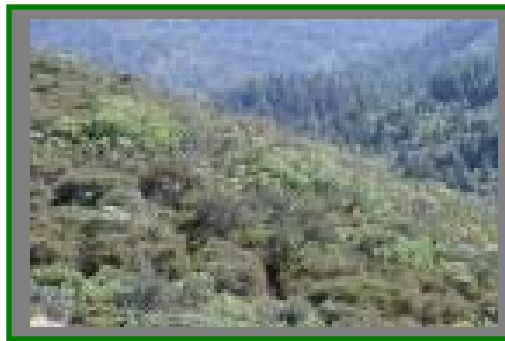
maintenance of species diversity has become one of the most important and robustly supported generalizations in ecology.

In the Klamath Region, fire has long been an influential dynamic process. Studies of historical charcoal accumulation over time have shown that the influence of fire has fluctuated continuously with climate. Its influence has been more pronounced during periods of warmer climate, such as we are now experiencing, and less pronounced under cooler climates.

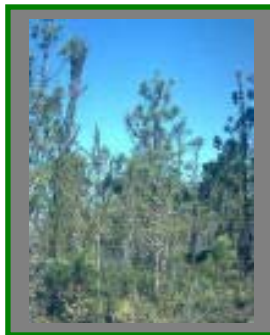
Studies indicate that fire has operated in a patch-wise fashion in much of the region. Over time, fire disturbances have created a complex mosaic of variation, in both stand age and species composition, across much of

the landscape. Such dynamics have helped maintain species that are dependent on fire disturbances, such as black-backed woodpeckers, which require forests of dead trees. This woodpecker is an example of a species that requires periodic fires, but also depends on sufficient intervals between them during which forests can grow unimpeded.

In between major fires that reset the successional clock, forests may experience several or many relatively light fires. These lighter fires thin forests, helping to produce the complex, multi-age forest structure common in the Klamath region and well-represented in the Klamath Network parks. However, certain other forests are not structured by light fires: Subalpine forests (such as those at Lassen and Crater Lake) and moist, coastal Douglas-fir forests (which occur at Redwood National Park) are instead generally even-aged, their age structure being dictated by infrequent, severe fires under extreme conditions. Chaparral and knobcone communities, common at Whiskeytown, are also even-aged. These are the most fire-specialized vegetation types in the region; they contain species which depend on periodic crown fires to create conditions allowing their offspring to grow. Physical and chemical properties of these species favor combustion, encouraging the relatively



*Chaparral (above) and knobcone pine (below) communities are the most fire-specialized vegetation types in the region... Physical and chemical properties of these species favor combustion, encouraging the relatively severe fires that they need to regenerate themselves...*



severe fires that they need to regenerate themselves. However, these plants also require fire-free intervals long enough for

them to replenish seed reserves depleted by fire-induced germination and mortality.

The link between diversity in fire patterns (pyrodiversity) and biodiversity in the Klamath region creates complex management issues, especially where goals are to maintain the vitality of ecosystems. There is serious concern that, due to fire suppression, the influence of fire has been greatly reduced in most areas in the region. However, managers may have no choice but to continue to suppress fires for safety reasons. How then can fire-

dependent species be maintained?

Prescribed burning is an option, but safety concerns make it impossible to deliberately reintroduce fire of the severity that these species may need.

Further complicating the issue is the potential influence of climatic warming on fire patterns. Because fire management options may not allow for natural fire regimes under current climate, it is especially important that we detect any loss of species that may occur as a result. Hopefully, along the way, we will help educate the public about living in a fire-prone environment whose high biodiversity may ultimately depend on our learning how to better accommodate the pyrodiversity that helped shape it.

# UNDERSTANDING LANDBIRD DIVERSITY

By **Daniel A. Sarr, Nat Seavy, John D. Alexander, and Paul Hosten**

(parts of this article were formerly published in natural resource year in review 2003)

*What drives landbird diversity* in the Klamath region? Scientists are learning that such fundamental conservation questions must often be addressed by landscape scale analyses that span park and agency boundaries. For example, scientists who analyzed data collected during Inventory and Monitoring field inventories of land birds in three federal conservation preserves think environmental conditions, such as climate and habitat diversity, may be important drivers of bird-diversity patterns in the Klamath region.

Scientists from the National Park Service (NPS) Inventory and Monitoring Program, the Bureau of Land Management (BLM), and the nonprofit Klamath Bird Observatory are jointly studying landbird diversity in Crater Lake National Park, Oregon (NPS); Cascade-Siskiyou National Monument, Oregon (BLM); and Whiskeytown National Recreation Area, California (NPS).

Crater Lake National Park, which has diverse and pristine habitat but a cool climate, supported a lower diversity of birds (38 species recorded) than the warmer, lower elevation parks. However, Whiskeytown National Recreation Area, the lowest, warmest preserve, was apparently no richer in species than Cascade-Siskiyou National Monument, which occupies intermediate elevations (70 vs. 78 bird species recorded, respectively). Cascade-Siskiyou, which straddles the crest of the Cascades Range, has exceptional variability in climate and vegetation, which may explain its high bird diversity. Most bird species showed peak abundances in either Crater Lake (Audubon's Warbler) or Whiskeytown, (Orange-crowned Warbler) suggesting that many bird species have preferences for either high or low elevations during their breeding seasons. However, each of the three preserves supports distinctive and complementary bird species, suggesting they perform unique roles in the conservation of regional land bird diversity.

The team is currently exploring the complementary role that disturbance plays in shaping the diversity and distribution of land birds in the Klamath Region.

